Briefing on Wireless Emergency Alert Service

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Agenda

- Introduction
- Evaluation of Technologies
- SMS
- Cell Broadcast
- Multimedia Broadcast Multicast Service
- Role of Government
  - Define EAS and its Requirements
- Next Steps

Introduction

- The need for an efficient comprehensive Emergency Alert Service is clear
- Cingular has evaluated at least 11 technologies
- Cingular has been a participant in the FEMA NCR Pilot
- The “silver bullet” for supporting a comprehensive Wireless Emergency Alert Service is currently undefined

FEMA Technology Comparison Draft

	SMS	CellBroadcast (CB)	TCP/IP-SMS Hybrid	NOAA Chip	Other Chip	MediaFLO/DVB-H
Broadcast paradigm	Point-to-point text on cellular nets	Broadcast text on cell nets	- Point-to-point initially - IP multicast (future)	NOAA Broadcast	FM radio broadcast	Broadcast video
Media	Text message	Text message	Text, voice, video, etc.	Text, voice	Text, data	video
Deploy time?	Immediate	???	~ 1 year	???	???	~ 1 year
GSM Capable	Yes	Yes	Yes	Implant	Implant	
CDMA Capable	Yes	Yes/ limitations	Yes	Implant	Implant	Yes
iDEN Capable	Yes	No	Yes	Implant	Implant	
Notify major city in a few minutes	No	Yes	No (in near term) Yes (with IP multicast)	Yes	Yes	Yes
Notify major city in < one hour	Unlikely	Yes	Yes	Yes	Yes	Yes
Geo-targeted alerting capabilities	1. Opt-in [zip code …] 2. From public records (data mining)[privacy?] 3. Government phones	Cell tower zone	1. Opt-in 2. Cell tower zone 3. Filter by velocity/direction More precision possible in future	Typically 40 mile radius ???	+/- 1 meter	???
Specific phone addressing?	Yes	No	Yes	No	Yes	No
Handset battery	No impact	Minimal ?	Minimal	???	???	???
Handsets ready:	Most	GSM (+ CDMA?)	Most new phones	No	No	Some new phones
Handset modif. required?	None	GSM – none CDMA - ???	No mod needed. Need software download.	Yes. Implant chip.	Yes. Chip implant.	Available in many new handsets.
Data security	Can be spoofed	Secure - AES	Secure - ???	No	Secure	
Signal vulnerable	Cell tower dependent	Cell tower depend.	Cell tower dependent.	NOAA tower.	FM station	???
User control & adaptability	Can be disabled. Overrides?	Can be enabled remotely?	Flexible. Subscriber selectable.	??	Flexible.	User selectable.
Impact on network	Significant network loading	GSM – minimal CDMA - ???	Network loading	None	None	Depends on implementation
2-way capable?	Yes	No	Yes	No	No	No
Deployment requirements	Opt-in websites, call-out platforms, business rules, cost recovery	Turn on CB; cell selector for each network + 1 broker; Trust Protocol for cost	Load software onto handsets, approved cost model	Handset engineering and integration	Handset engineering and integration	???
Historical messaging	No	No	Yes	No	No	No
Data rate	??	320 bps	Network dependent	520 bps	1200+ bps	??
Issues	How best to work with carriers? Carrier liability; cost recovery; business rules for Federal, State, and local activation					

European View on Technology Comparison

ETSI TR 102 182 V1.1.1 (2006-03)

Emergency notification systems shall:	Paging	CB	SMS	TV	MBMS	MMS	USSD	Legend
be able to reach citizens in their own dwelling;	V	V	V	V	V	V	V	V = compliant
be able to reach citizens at their place of work;	V	V	V	V	V	V	V	V = compliant
be able to reach citizens in public venues;	V	V	V	V	V	V	V	V = compliant
be able to reach a citizen citizens on foot;	V	V	V	V	V	V	V	V = compliant
be able to reach a citizen citizens in a vehicle;	V	V	V	X	X	V	V	V = compliant X = watching video while driving a vehicle is not desired
provide sufficient instructions regarding actions to be taken;	V	V	V	V	V	V	V	V = compliant X = non-compliant
provide identification of the message/notification originator;	V	V	0	V	V	0	0	V = compliant 0 = compliant, but no certainty
deliver messages within a planned specified time;	V	V	0	V	V	0	0	V = compliant 0 = non-compliant for large audiences
allow simultaneous delivery to targeted, large audiences or geographies;	V	V	X	0	V	X	X	V = compliant 0 = non-compliant to geographies X = non-compliant
offer sufficient details of the emergency situation;	V	V	V	V	V	V	V	V = compliant
be able to retry delivery when the initial message delivery fails;	V	0	V	0	V	V	V	V = compliant 0 = messages can be repeated
support delivery of notification messages to those with special needs and unique devices, like terminals of hearing and speech impaired persons;	V	0	V	0	0	V	V	V = compliant through terminal capability 0 = partly-compliant
have the ability to deliver messages in multiple languages;	V	V	V	V	V	V	V	V = compliant
be capable of addressing congestion management across the various networks used.	V	V	X	V	X	X	X	V = compliant X = non-compliant

Other Technologies

- FM Radio in the Handset
  - FM radio is not continuously active, so subscriber would not hear the alert
    - Major challenge -> Which frequency to monitor?
  - Subscriber must use a headset for the FM radio function
    - Antenna is built into the headset wire due to the frequency of the FM radio band and the associated antenna size
- NOAA Weather Radio in the Handset
  - Same problem, would not be continuously monitoring
    - Which frequency?
  - Antenna challenges in a handset at 162MHz frequency
    - Quarter wave is too large for handset form factor
    - Smaller would be “electrically small” less efficient antenna
      - Assuming that the antenna should operate down to the minimum expected noise level of 5 to 16 DB above kTb, the antenna should be at least 30% efficient. This would require a dipole of about 8 inches that would extend outside the housing of the handset.
      - Antenna that would fit handset form factor may be 2% efficient
  - SAME code programming challenges
    - Only home area?

Short Message Service (SMS)

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SMS Characteristics

- Point to point text based communication service
- Each SMS message can contain up to 130 text characters
- Network side of SMS is common across the air interfaces
- Store & Forward
  - Can result in messages delivered out of order
- Reliable - but has characteristics that may give impression of unreliability, i.e. message delay
- Can only target specific mobiles and so its suitability to reach large numbers of mobiles in a reasonable time frame is limited
- SMS in itself provides no location information

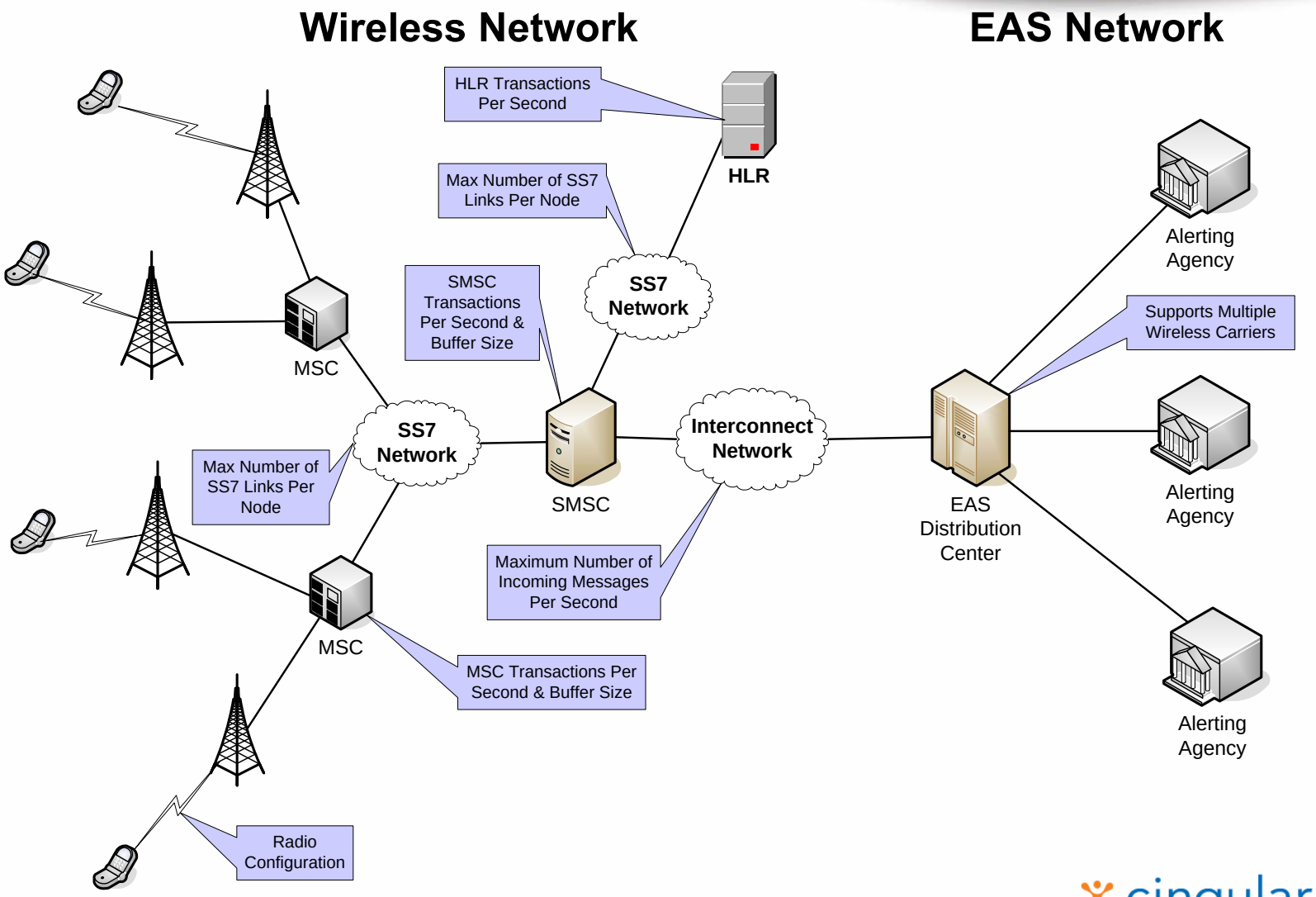
Cingular SMS Study

- Cingular has studied the use of SMS for an emergency alert system
  - To answer the questions:
    - Can SMS be effectively used to deliver an EAS service?
    - What are the performance, capacity and latency issues for an SMS-based EAS service?
    - What happens to our network if a large number of SMS messages are delivered at once?
- Study used real network configurations and traffic loads
  - Traffic loads in Cingular markets during Katrina and Rita
  - Adding EAS on top of these loads
  - Assumed Wireless Priority Service traffic was also in use
- Cingular Experience with SMS
  - American Idol

SMS Delivery Network

- SMS Delivery requires several computing elements in the network; e.g.
  - Short Message Service Center (SMSC)
  - Home Location Register (HLR)
  - Mobile Switching center (MSC)
- Computing Elements are limited by the number of Transactions Per Second (TPS) they can support
- TPS of the element will set a bound on the delivery time for an SMS message..
  - But is only one factor
- SS7 Link Capacity between network elements is also a major factor
  - Maximum Number of Links between elements

SMS Possible Points of Congestion



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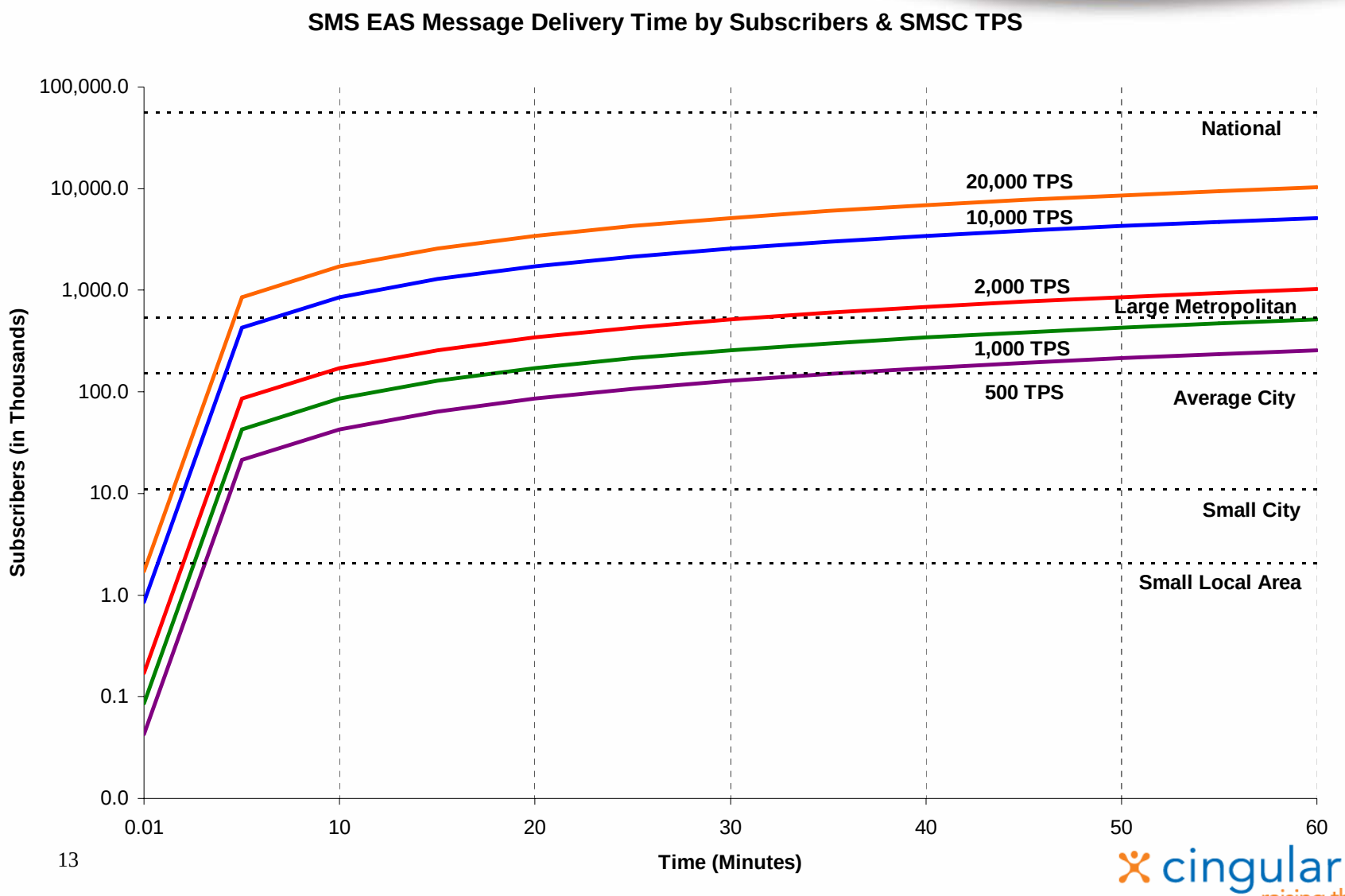
SMS-based EAS Use Cases

- Use Case #1 – Small local area
  - Size of affected area is 3 square miles
  - 2,850 people per square mile
- Use Case #2 – Small town or city
  - Size of small town is 16 square miles
  - Population of the small town is 45,000
  - 2,850 people per square mile
- Use Case #3 – Average size city
  - Size of city is 68 square miles
  - Population of the city is 633,500
  - 9,316 people per square mile
- Use Case #4 – Large city or metropolitan area
  - Size of city is 33 square miles
  - Population of the city is approximately 2.21 million
  - 66,940 people per square mile
- Use Case #5 - National

Transactions per Second Limitations



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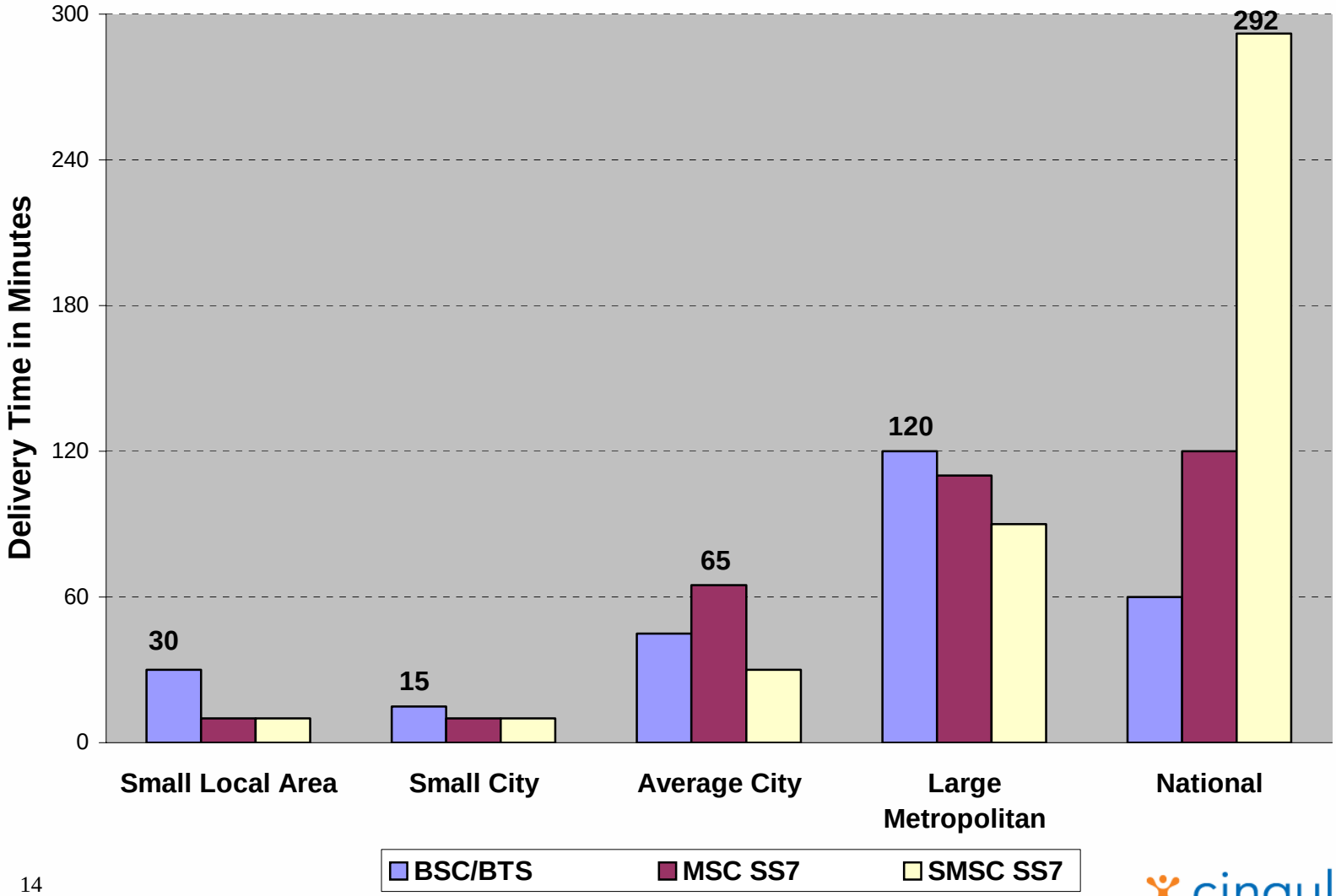
SMS-based EAS Message Delivery Times



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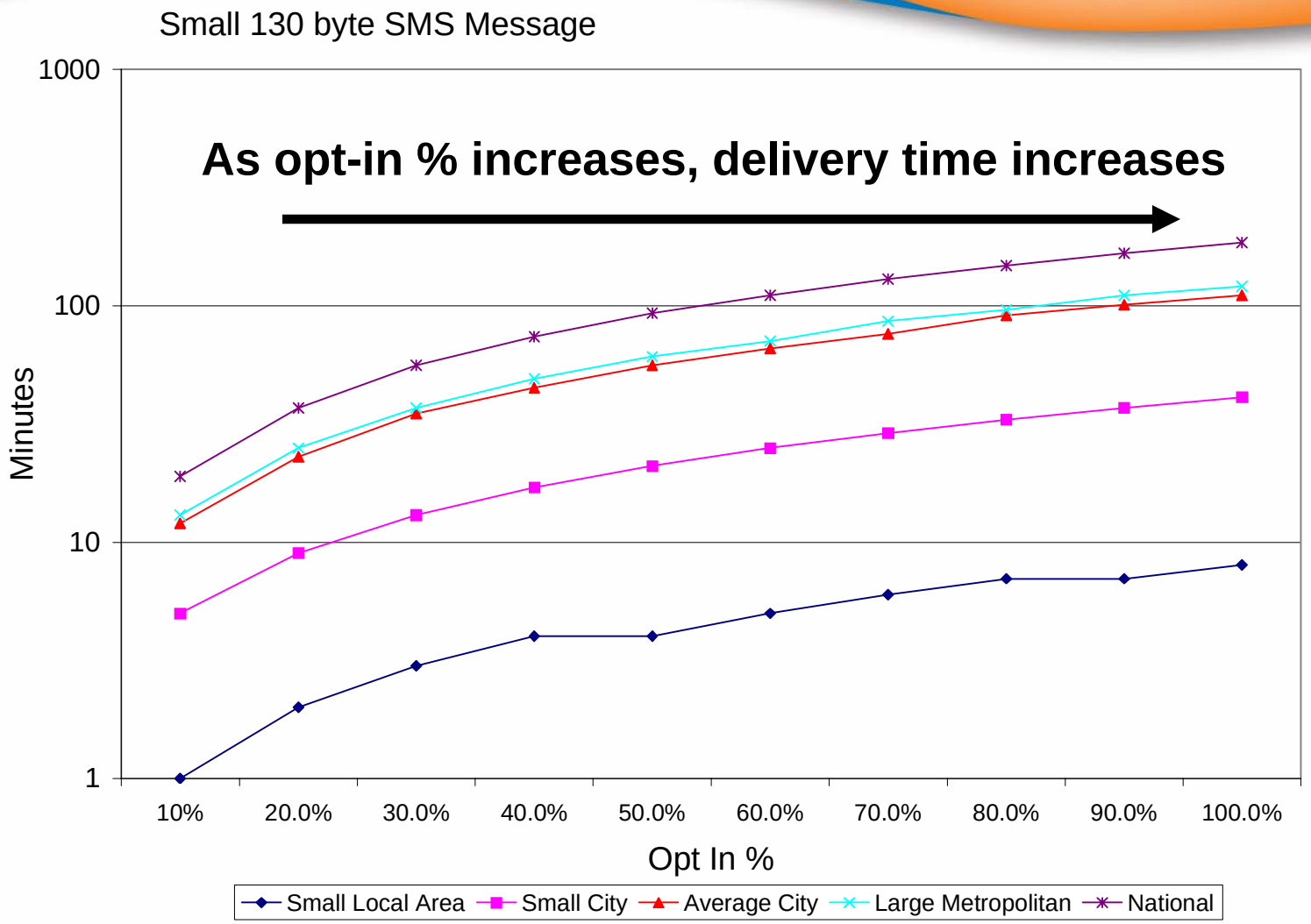
EAS Delivery Time vs. Opt-in %



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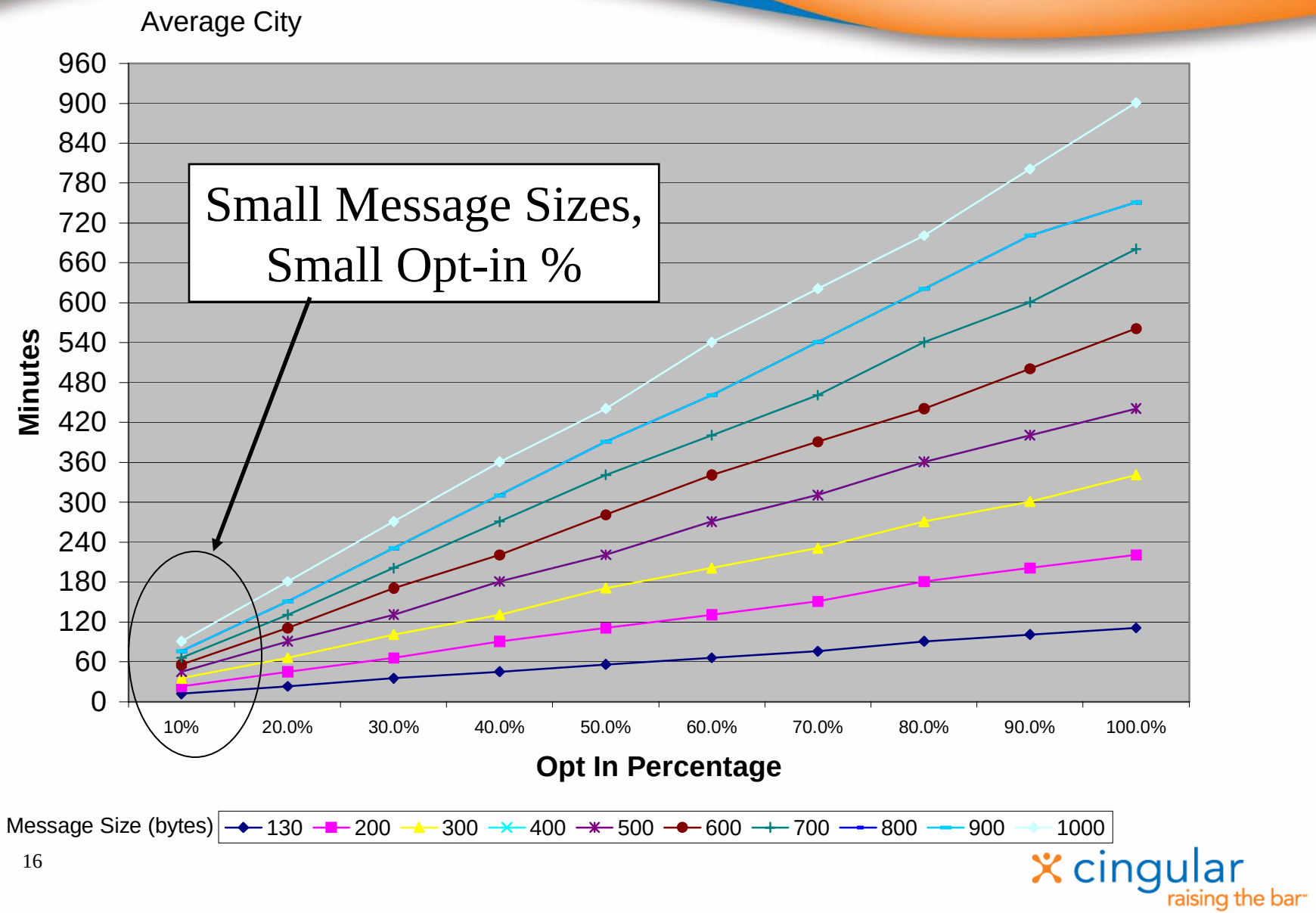
EAS Delivery Time vs. Message Size & Opt-in %



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Cingular Use Case Analysis

- Conclusion → For all but the smallest number of subscribers, SMS EAS message delivery times can exceed 1 hour, and may require multiple hours for delivery
  - During events, subscribers will also use their phones to make calls, send messages, send pictures (London Bombings example), increasing the network load and thus increasing the latency problem
  - These additional traffic loads were not factored into the analysis
- Delays are primarily network based, not air interface based
  - Networks are engineered to maximum anticipated busy hour load and maximum SS7 links already

National Communications System Analysis

- SMS over SS7, TECHNICAL INFORMATION BULLETIN 03-2, December 2003
- SMS message occupies a Standalone Dedicated Control Channel (SDCCH) channel for 4-5 seconds, each SDCCH can handle 15 messages/minute
  - A sector with 4 Transmitter/Receiver (TRXs) might have 8 SDCCH channels and a capacity of nearly 7200 SMSs/hour, or 120 SMSs/minute
- Washington, DC, population of 572,059 distributed over 68.2 square miles
  - average density of 8,388 people/sq mi
- Covered by 40 cell sites with 120 sectors
  - average sector covers approximately 6000 people
  - Assume 60% penetration, or 3600 subscribers per sector
- Generate 3600 messages/minute in each sector, or **30 times greater than the 120 SMSs/min a sector can process**

Conclusions of NCS TIB 03-2

- "By examining the Washington, DC, and Manhattan scenarios, it can be concluded that, if SMS were used extensively during a crisis, **a significant SMS load could be placed on a network. Individually, the voice load and SMS load are multiple times higher than the engineered capacity at each sector**. This analysis has not considered several factors that might increase load, such as messages originating from other sources (e.g., the Internet) and terminating in the congested area. It has also not considered message re-send attempts after failures, which add to network load."

Finnish Report

- *"The most significant benefit of the SMS system is that an emergency alert sent through it can be received by all mobile stations without any special arrangements. The greatest disadvantage is that the system is slow, and the greater the number of recipients, the greater the disadvantage. ….. It follows that it would take about 1.5 hours to transmit 100,000 messages."*
  - Finnish Communications Regulatory Authority Working Group Report on Use of Text Messaging in Public Safety Alerts, September 2005

Real SMS Alert Experience

YAHOO! NEWS

SMS glitch mars testing of new tsunami warning system
Wed May 17, 12:18 PM ET

Delayed SMS messages in Thailand marred otherwise successful trial of a regional tsunami warning system by dozens of countries across the Pacific.

The exercise, code-named Pacific Wave '06, was initially declared a success by officials at the Pacific Tsunami Warning Centre in Hawaii, who said a series of earthquakes hitting the region for real had not disrupted the test. …

Of more concern to test organisers was news later that plans to alert emergency coordinators to tsunami threats failed to work in Thailand when busy cell phone networks took hours to deliver key messages.

"The problem we faced was with communications. **We have no idea whether our messages sent to local operations chiefs by fax and SMS arrived on time or not, and by midday some of them said they did not recieve the SMS**," Pakdivat Vajirapanlop from the National Disaster Warning Center told AFP. ….

"We need to know whether they have received our messages. **What can they do if the messages don't arrive on time? Then the warning is useless**," said Pakdivat, the center's deputy operations chief.

http://news.yahoo.com/s/afp/20060517/wl_afp/pacificweathertsunami

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Lack of Security & Spoofing Prevention Techniques

Vadodara: Terror on your mobile
Harish Gurjar
CNN-IBN

Posted Friday , May 05, 2006 at 07:59
Updated Friday , May 05, 2006 at 08:41
Vadodara (Gujarat): In a bid to avoid a repeat of communal clashes like the ones in 2002, the police has arrested 138 people in Vadodara for **allegedly spreading rumours and instigating violence through SMS**.

The government of Gujarat had suspended SMS service in Vadodara for a day on Tuesday, to ensure that mischief-mongers don't create panic by spreading false rumours.

However, immediately after the service was resumed, messages instigating rioting started making the rounds.

- ETSI TR 102 444 V1.1.1 (2006-02), **Analysis of the Short Message Service (SMS) and Cell Broadcast Service (CBS) for Emergency Messaging applications**

- "For mobile terminated national emergency messages **it would be possible for spam either from a mobile phone or from the Internet to create malicious emergency messages and cause a panic reaction for many mobile subscribers**. Such abuse is possible today and although tracing the origins of Short Messages is inherent in most SC's, providing evidence of such Short Messages is difficult as content is not generally stored in SC call data records."

http://www.ibnlive.com/news/vadodara-terror-spread-through-sms/9477-3.html

False EAS SMS Messages Will Cause Panic

thenewstribune.com

PRINTER-FRIENDLY FORMAT

False alert of Rainier mudslide raises fear
ROB TUCKER; The News Tribune
Tacoma, WA - Friday, May 26, 2006

SMS Has No Security!

A Puyallup emergency radio station mistakenly broadcast an emergency lahar warning Wednesday and horrified some people who heard it.

The transmission was aired on Puyallup's 1580-AM frequency for nearly an hour. It advised people that a massive mud flow was on its way down from Mount Rainier to the Puyallup Valley. It told people to seek higher ground.

"I was in tears," Hutchinson said. "I was shaking." Her 17-month-old son, Ethan, was in the car with grandma, somewhere in the danger zone. After Hutchinson warned co-workers in the office, about 30 people started frantically calling loved ones. Some called their children at schools in the Puyallup Valley and told them to leave immediately, said LaNell Hoppe, the office manager at InVivo Health Partners, a medical billing and software company. "It was so scary," Hoppe said. Someone called Orting City Hall. Orting contacted federal authorities. They all confirmed that no lahar was coming.

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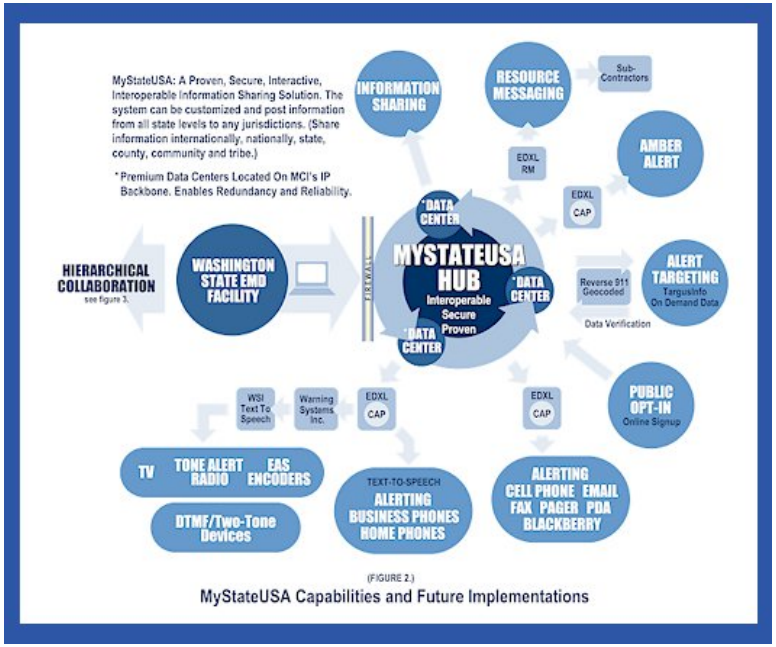
SMS-based Denial of Service Attack

- "Exploiting Open Functionality in SMS-Capable Cellular Networks"
  - Enck, Traynor, McDaniel, La Porta – Pennsylvania State University
  - CCS '05, November 7-11, 2005, Alexandria, VA
- "ability to *deny voice service* to cities the size of Washington D.C. and Manhattan with little more than a cable modem"
  - "Moreover, attacks targeting the entire United States are feasible"
- Even though there are protections in the network to protect against attacks from the Internet, the principles of this paper show that large numbers of simultaneous SMS messages can have serious consequences

Other SMS Issues

- Lack of Support of Roamers
- Lack of Geographic Specificity
- Lack of Multi-Language Support
- Lack of Special Alert Tones on Handsets
  - How do I know this was an “emergency” SMS?
- Lack of Message Prioritization
  - Emergency SMS will not get priority delivery
- SMS Concatenation Problem in Some Handsets
  - Problem rebuilding lengthy text message
  - Could require message size limits < 130 characters
- Prepaid is a challenge ->
  - Additional latency
  - If pre-paid time “runs out” then will not receive service

States & Locals Implementing Their Own Solutions



(FIGURE 2.)
MyStateUSA Capabilities and Future Implementations

No Carrier Input or Impact Analysis
for These Solutions

Desire a Single Solution Taking into Account National, State, and Local Requirements

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So Why Do Amber Alerts Work?

- Centralized Control, Authentication and Distribution of Messages
- Low number of subscribers due to “opt in” nature
- Only targeted to specific zip codes, further minimizing number of messages sent
- Small message size
- Low number of messages
- Low frequency of messages

What About Geo-location in SMS-based EAS?

- Several proposals to provide geographic specificity for SMS have been circulating
- These target the geo-location issue, but do not address other issues mentioned
  - Some proposed geo-location methods actually increase the latency and congestion issues as they add more signaling traffic to an already congested network
  - Handset GPS-based geo-location requires SMS messages to be delivered to mobile, then the mobile decides if the customer is in the target area
    - Latency and congestion still an issue

What Could Cingular Support Short-Term?

- An interim SMS-based EAS service that is:
  - Voluntary for the carrier
  - Opt-in for the subscriber who has a valid subscription and handsets which are capable of receiving text messages
  - Support Presidential-level messages only
  - Must be limited in size as to not exceed the ability to deliver the alert message in a single SMS message to the consumer
    - "ALERT HURRICANE EVACUATION TUNE TO LOCAL RADIO, TV OR NWS FOR DETAILS"
- SMS-based EAS will not meet all desired emergency alert service requirements

What Would a Carrier Have to Do to Support SMS-based EAS?

- Build extra capacity in the network
  - Costly over-engineering
  - Additional node(s), perhaps dedicated to EAS
  - Cost recovery
- Difficult and costly to add SS7 Capacity
  - Limits on number of links engineer-able between nodes
  - Typically engineered to maximum number of links between nodes
  - Additional links would require additional nodes
    - MSCs are significant challenge
- Even extra capacity will not guarantee SMS delivery or solve latency and other identified problems, but may add some protection to the carrier's network

Carrier Liability

- With all these limitations on SMS-based EAS, a carrier needs liability protection for…
  - non-delivery
  - late delivery
  - degradation of service due to network impacts resulting from SMS based alert messages
- Carriers must not be held liable for false SMS based alert messages being delivered on their networks
- For an opt-in service, carriers cannot be held liable for failure to deliver due to the customer providing incorrect information as part of the opt-in process

SMS Summary

- If the Commission desires an SMS-based EAS solution, it must be realized that the SMS-based solution is only an interim solution that will not scale to support a large number of customers, and delivery of SMS-based alert messages can experience significant delays (measured in hours)
- Based on experiences and modeling, is it worth advertising an “Emergency Alert” service that most likely will fail when needed most?
  - Pacific Wave '06 …

Wireless Broadcast Services

Cell Broadcast Service
Multimedia Broadcast Multicast Service

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Cell Broadcast Service (CBS)

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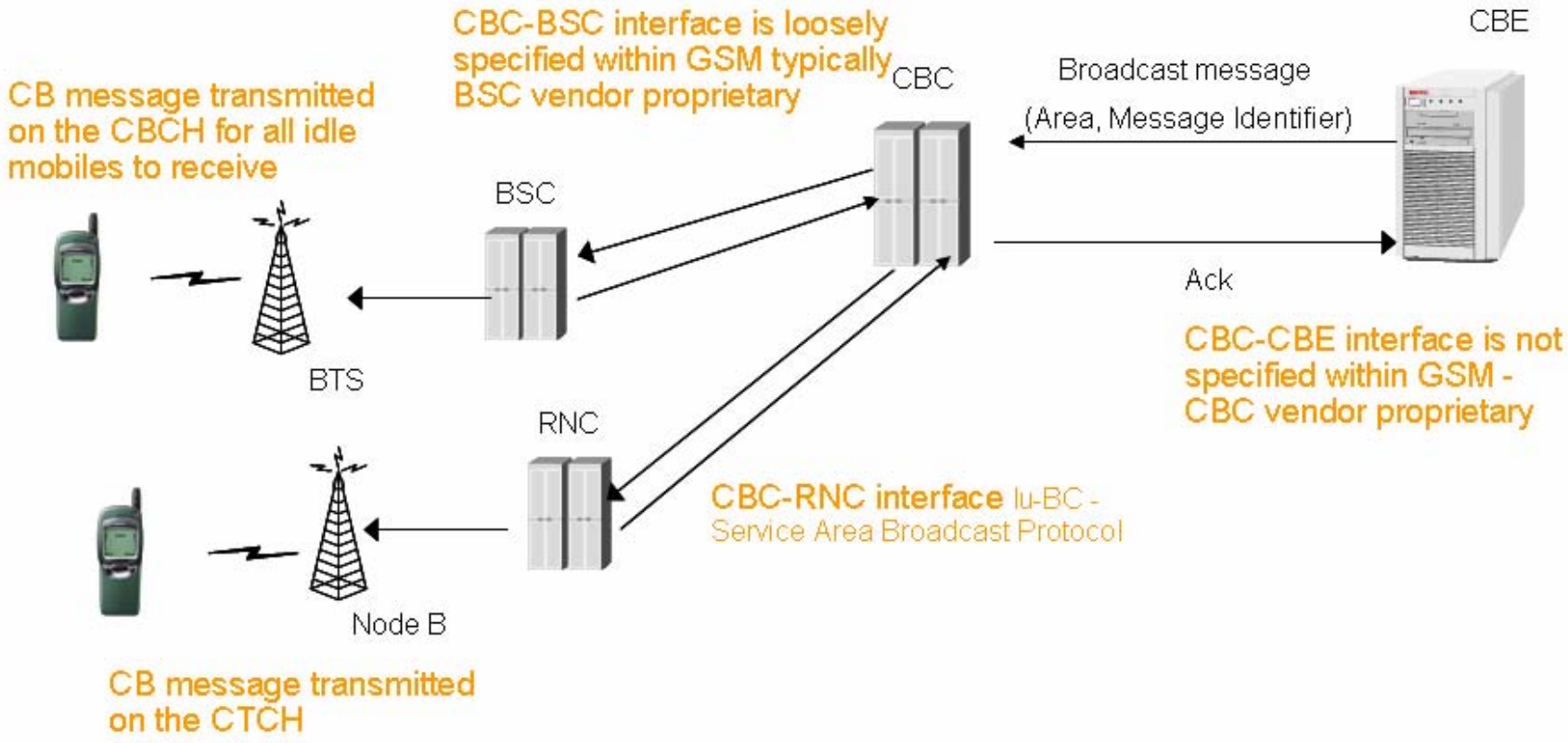
CBS Characteristics

- CBS text messages are downloaded to the BTS/BSC
  - BTS/BSC to repeat the broadcast at the required period
- Allows text messages to be broadcast to all mobiles in a given country, all mobiles in a selected group of geographical locations, or all mobiles in a particular cell area
  - Difficult to dynamically define the geographic areas
- Text messages may be up to 15 pages of 93 characters
- CBS Text Messages are sent on a dedicated broadcast channel that makes it less liable to problems of congestion

CBS Characteristics

- The handset has to be specifically enabled by the subscriber to receive CBS messages
  - See slide 38 for the current handset status
- Will not receive messages if on a voice or data call
- Multi-Language Support
- Roamer Support
  - All configured & enabled terminals in a cell able to receive EAS message
- Problems with high power drain in mobile handsets and difficulty in providing a user friendly MMI have limited handset development
- CBS has been deployed by relatively few operators
  - **None in the U.S.**

CBS Architecture



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CBS “State of the Union”

- No U.S. Operator has deployed CBS
- Current Cingular handsets do not have CBS enabled
  - Handset/SIM card combination are such that CBS menus are not visible to subscribers
  - Software for CBS may or may not exist in the handset
  - CBS in handsets have never been tested or validated
- Network Infrastructure is not in place to support CBS
  - Requires BSC/BTS software upgrades
  - Requires additional network node (CBS)
  - Requires provisioning & billing changes
- Significant testing required if CBS enabled

CBS Handset Battery Life Impacts

- Mobiles would need to monitor for Emergency Cell Broadcast continuously for an effective emergency system
- ETSI TR 102 444 V1.1.1 (2006-02), **Analysis of the Short Message Service (SMS) and Cell Broadcast Service (CBS) for Emergency Messaging applications**
  - "A MS (i.e., handset) normally has to be specifically enabled by the subscriber to receive CBS messages. Once enabled, **mobile manufacturer's report a considerable drain on battery life**, although there are techniques in the specifications (DRX) to reduce this problem. Concerns have been raised by mobile manufacturers on the effectiveness of DRX, as any enabling of CBS, with or without DRX can reduce the "talk time" of their products, which is a key marketing differentiator. **For this reason, MS's (i.e. handsets) are normally shipped with the Cell Broadcast feature switched off.**"
- Battery life is an important part of the consumer experience

CBS Battery Issues

- June 3rd 2004 the following statement from GSMA to 3GPP T2
  - "…..When cell broadcast monitoring of a channel is enabled, there is significant battery drain on the terminal device, as it continually monitors for incoming CB pages on that channel. For some handsets this can reduce the standby time **by up to 50%.** (This is especially inefficient if the page data on the channel never changes or is seldom changed) ….."

CBS Deployments

- Once the requirements for EAS-based CBS were known, it would take at least 18-24 months to deploy in networks
  - Longer if CBS standards need to change to support EAS-specific requirements
  - 3GPP is currently looking at a study on a “Public Warning System” designed to be a global standard
    - Study targeted to be complete December 2006
    - Standards development in 3GPP Release 8 (2008)
      - Deployment requirement of 18-24 months following this standard development
- CBS would require carrier investment
  - Updates to infrastructure
- CBS will require new handsets to consumers
  - Several years to get these out to the consumers
  - Customers will be required to buy a new handset

CBS Future

- CBS is a limited technology
  - Text support only
  - May not address all use cases, e.g. push down of maps
  - Will require special modifications for the visually impaired, such as a special alert tone
  - No multimedia support
    - ***The future is multimedia***
- Some vendors removing support for CBS from future product releases due to lack of support
- 3GPP proposed to remove CBS from the “System Architecture Evolution”
  - Carriers, especially those in Asia and Europe objected, so it’s in there for now

Multimedia Broadcast Multicast Service (MBMS)

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MBMS Characteristics

- New Technology
  - Very little field experience
  - Initial product availability EOY2008-2009 timeframes
- Provides a broadcast method for multimedia
  - Maps, video & audio clips, still pictures, graphics, etc.
- Seamless integration of broadcast/multicast transmission capabilities into 3G service and network infrastructure
  - Allows a “True” broadcast on the radio
  - Uses IP Multicast Framework for services
- Roamer Support
  - All enabled terminals in a cell able to receive EAS message

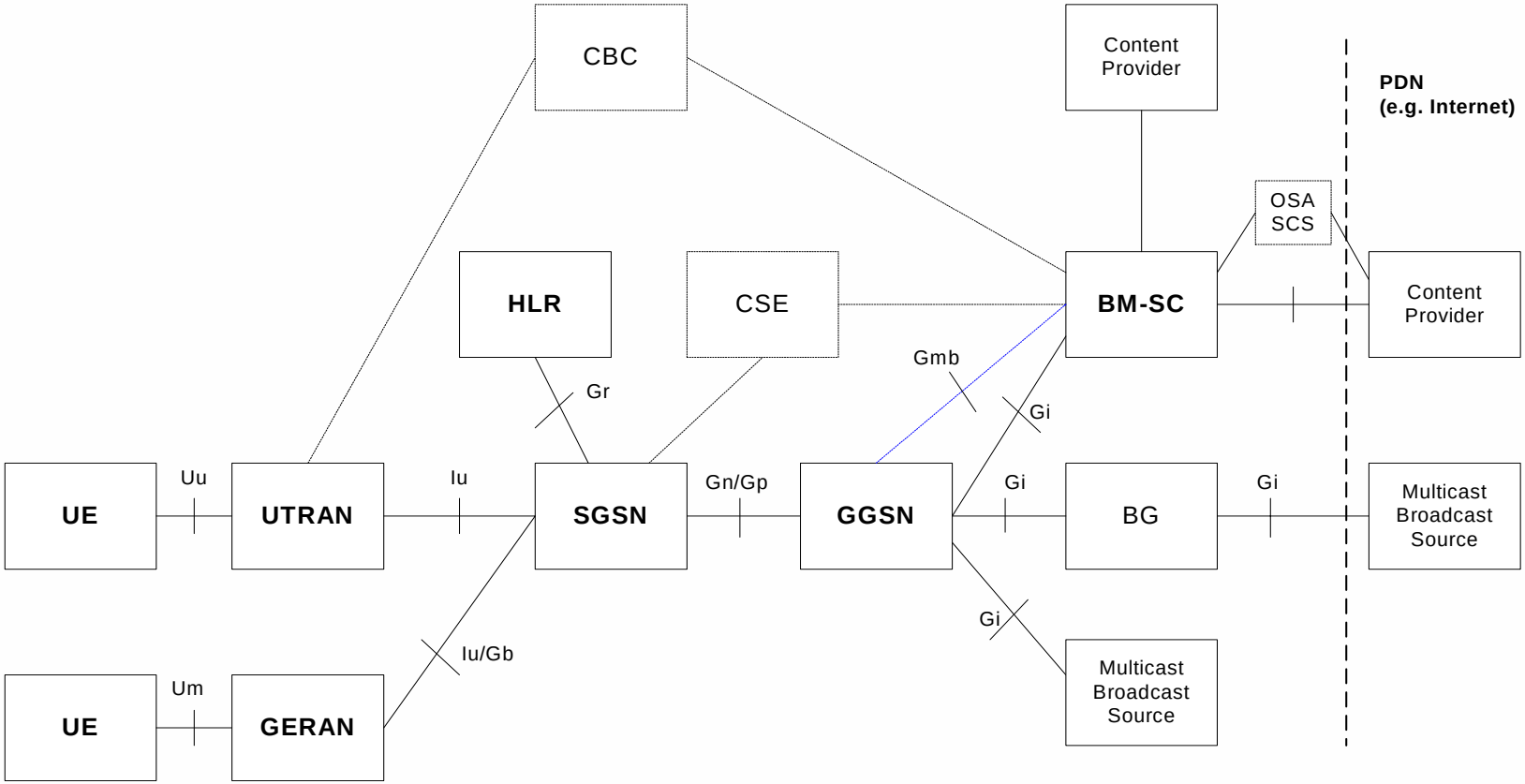
MBMS Characteristics

- Accessibility (for Individuals with Disabilities)
  - Not only text messages
- Multi-Language Support MBMS Service Area Defines Geographical Area, Where Specific MBMS Session is Sent
  - Only MBMS handsets in Service Area Paged
  - Group of One or More Cells
  - Difficult to adapt dynamically for small localized affected areas for events
- Spectral efficiency issues
  - Can take away up to 15% or more of cell power during transmission, lowering available bandwidth for users on that cell

MBMS Characteristics

- MBMS is likely to be supported in urban areas first
- Can be received while on a voice or data call
- Requires new handsets
- Standards available, but need “tweeks”
  - Opportunity to bring in requirements specific to emergency alert services
- Costly to deploy (many network elements impacted)
  - In both *dollars* and *time (EOY2008-2009 initial availability to consumers)*

MBMS Architecture



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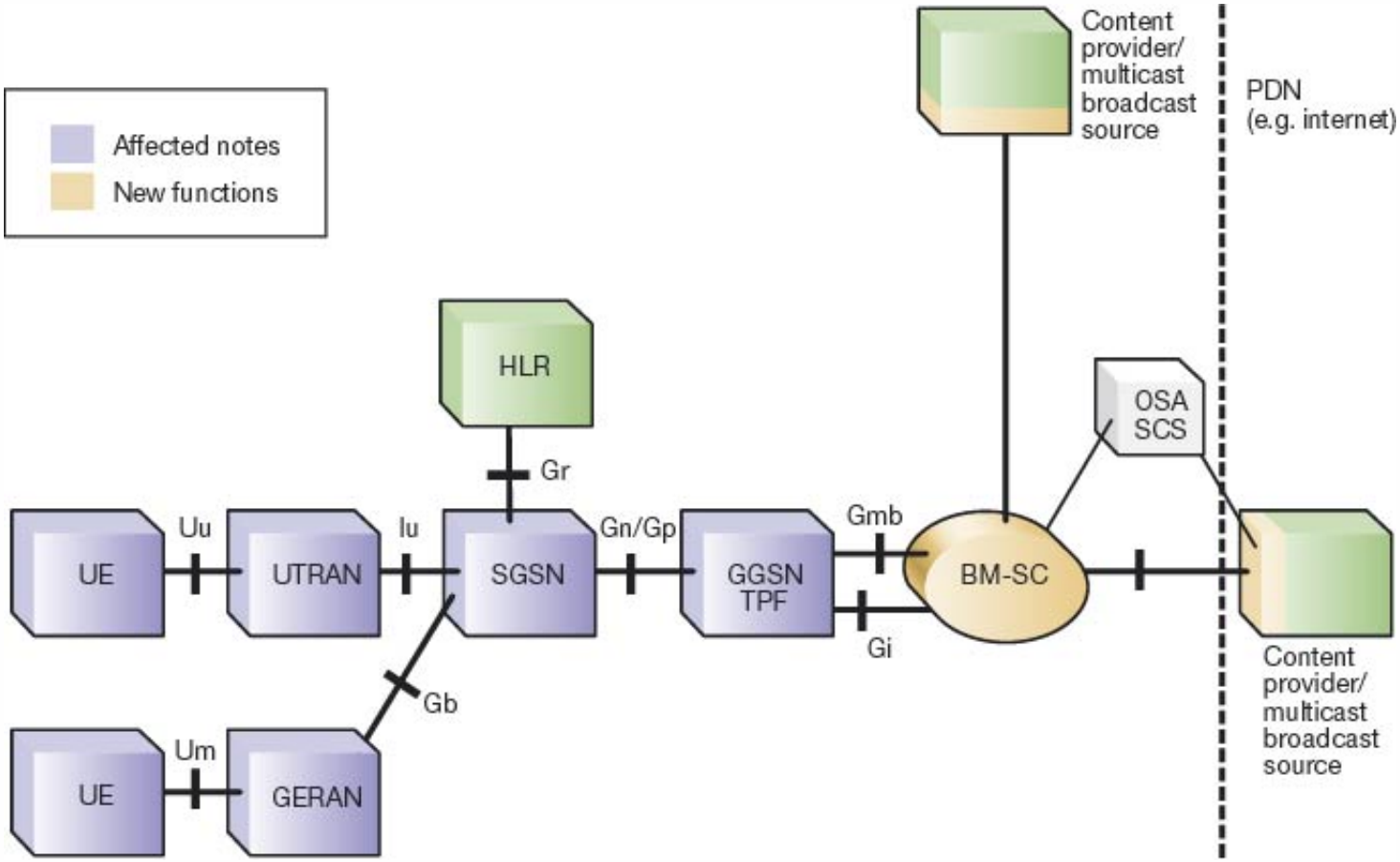
Network Element Impacts to Support MBMS



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Wireless Broadcast Summary

- CBS and MBMS are both technologies that can, in theory, support an efficient Emergency Alert Service
  - Each technology has it's pros and cons, and associated costs for deployment
    - These pros/cons must be evaluated against the service requirements
  - Both CBS and MBMS require new handsets
- Cingular is evaluating which of these technologies might best support an alert service
  - But requires clear service descriptions and requirements before a choice can be made

Next Steps

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Summary

- Cellular broadcast technologies (e.g., Cell Broadcast, Multimedia Broadcast/Multicast Service) may eventually provide the best solution for large-scale emergency notification on mobile wireless networks
  - But this depends on the nature of the EAS requirements
- No single solution exists for legacy & future handset devices
- New handsets are required
- Any solution will require cost recovery

Steps Forward

- Policymakers and mobile network operators must work together closely to develop EAS requirements that can reasonably be met by mobile wireless networks
  - Don’t mandate a *technology* for Wireless Emergency Alerts
- Follow the *Wireless Priority Service* model
  - Joint Government-Industry Partnership
- Expectations for a Wireless Emergency Alert Service need to be developed **first**
  - Use Cases
  - Requirements
  - Timelines

Steps Forward

- Based on the expectations, the industry needs to look at available technologies to decide the best way to support the expectations
- Any decision to incorporate mobile wireless networks into the EAS must take into account the time needed to develop and implement technology choices
  - Standards enhancements may be required to support the requirements for an Emergency Alert Service
    - National vs. global standards

Key Questions That Need Answers

- A sample of the questions that must be answered before technology choice is made (*not limited to these*):
  - Who does an alert need to be delivered to?
  - How geographic specific does the alert need to be?
  - How dynamic is the geographic specificity? If dynamic geographic area is required, who and how is it defined?
  - Who is authorized to initiate alerts?
  - What are the expectations on delivery time?
  - What specific information and how much information needs to be delivered?
  - How are alerts cancelled? Do alert cancellations need to be delivered?
  - Do emergency alerts pre-empt calls or data sessions in progress?
  - Is a priority mechanism required for alert messages?
  - Are there different priorities for categories of alert messages?
  - Are there categories of alert messages that subscribers can opt-out of vs. categories that are mandatory?
  - Is there a “monthly” testing requirement, and does that need to be delivered/displayed to subscribers?
  - Is there a message delivery confirmation required?
  - What is the requirements for message re-tries or re-transmissions, or continuous transmission?
  - What are the requirements for supporting multi-languages or citizens with disabilities?
  - How are national, state and local alerts coordinated?
  - Will there be an information aggregator?